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Ourania Kosti
Nuclear and Radiation Studies Board
National Academies of Sciences, Engineering and Medicine
500 5th Street, NW
Washington D.C. 20001

Dear Ms. Kosti:

Thank you for the opportunity to provide input to the National Academies of Sciences, Engineering, and Medicine on its independent assessment of technology development efforts within the U.S. Department of Energy's (DOE) Office of Environmental Management.

The State of Oregon has participated in the Hanford Site cleanup since it began. Our primary concern is to help ensure that cleanup decisions are protective of the Columbia River now and into the future.

We have often seen the need for and advocated on behalf of the development of new technologies at Hanford. We won't attempt to review the full record of technology development that has occurred during the almost 30 years of the Hanford Site cleanup. We'll leave that to DOE and others.

We would, however, like to highlight some of what we consider to be successes in technology development at Hanford. We will also provide a cautionary note about less successful technology development, and some of the reasons it was unsuccessful. Finally, we would like to offer our recommendations for areas needing new technology.

The direction from Congress requires the Academies to assess technologies that could "reduce the long-term costs," and "accelerate schedules." However, more than cost and schedule have to be considered in the scope of what is necessary to accomplish a lasting and protective cleanup at Hanford. While we recognize there is considerable work to be done at Hanford and a definite need for the development of new technologies, whether they result in cost or schedule savings is less urgent a question than whether they protect people and the environment – *that* is and must remain our priority.

The development of new technologies to retrieve waste from Hanford's single-shell tanks was in many ways highly successful. DOE has a number of different technologies available now to retrieve sludge and saltcake from the single-shell tanks, including the Mobile Arm Retrieval System, the Foldtrak, enhanced reach sluicing systems, and other technologies. The development of these "tools" was absolutely necessary to be able to retrieve wastes at a rate that will be necessary to feed the Waste Treatment Plant. Yet, it did not come quickly or inexpensively. The development of this retrieval technology spanned a good decade and cost tens of millions of dollars. Retrieval of the 16 tanks in Hanford's C Tank farm took more than a decade at a cost of many hundreds of millions of dollars. We are hopeful this

investment will make the next tank farm retrievals cheaper, faster, and better than before – the rare trifecta.

We are also impressed with some of the technology development that has occurred in terms of groundwater cleanup. The apatite barrier in the N Area has proven its effectiveness to bind strontium to the soil (though we're still waiting for it to be fully installed). The use of an underground chemical barrier to change Chrome-VI to Chrome-III has also been relatively effective. We've also seen considerable improvement through the years in the effectiveness of the resins in the pump-and-treat facilities to retain chromium – though some of that development has come through the suppliers of the resin, rather than something that was done at Hanford.

We are encouraged by DOE's research into advanced glass formulas in an effort to increase the waste loading per canister and maintain long-term performance. Success in this arena could potentially save DOE billions of dollars by reducing the mission duration, reducing ultimate disposal costs, and supplanting the need for a supplemental low-activity waste treatment capability.

At times, we've seen a reluctance by DOE to make use of existing technology if it hasn't previously been used at Hanford. As early as 1986, Oregon advocated for use of slant well drilling beneath Hanford's tank farms to better understand what happened to the waste that leaked from the tanks. The first slant well was not drilled until 2000. That well, beneath the SX tank farm, provided extensive information about contaminants leaked from the tanks. We expect this information will also prove useful as DOE attempts to achieve final closure of the tank farms.

Long-term effectiveness needs to be a key consideration in the development and deployment of any new technologies at Hanford. DOE and its contractors have been investigating soil desiccation at Hanford – drying an area in the subsurface to stop the further migration of contaminants. Though short-term results have been somewhat promising, we question the ability to ensure such a technique can be effective over a long period of time. Re-wetting seems likely to occur at some point.

Not surprisingly, there have been some failures in technology development at Hanford. What seemed like good ideas didn't necessarily pan out, and after a few years of investment, those technologies were abandoned – at least as far as Hanford. Examples include in-situ vitrification of contaminated soil and the installation of a physical wall into the ground to stop contaminated groundwater from migrating into the Columbia River.

More troublesome have been those attempts that were not quickly abandoned – that dragged on and sucked money away from the cleanup. Examples here include bulk vitrification, which was investigated for nearly a decade at a cost of tens if not hundreds of millions of dollars, and the consideration of grout for much of Hanford's tank waste, which was seemingly abandoned more than two decades ago, but once again has been revived.

From our perspective, the pursuit of a new technology most benefits the Hanford cleanup when it leads to a final and lasting reduction of long-term risk. Technologies that actually remove waste from the environment pay long-term dividends by reducing the total cost of natural resource injury under CERCLA. They also reduce uncertainties related to contaminant fate and transport and the cumulative risk of multiple contaminant sources, which are critical both for ensuring the long-term performance of onsite disposal areas and for validating that cleanup has truly been accomplished.

This pursuit of the "new shiny thing" does carry some risks. We are wary when new technologies may lead to long project delays and diversions of a limited site budget away from direct cleanup. If a new technology can be tested in such a way that the costs won't divert cleanup funds and there is a reasonable expectation that the consequences of failure won't lead to a new injury, we are open to taking a risk and seeing what we learn.

We do see the need for technology development to address the following at Hanford:

- Remediation of wastes in the deep vadose zone, including leaked tank wastes in and beneath the tank farms and wastes from cribs and other liquid discharge points (other than traditional excavation).
- Targeted retrieval of concentrated wastes within the solid waste burial grounds (other than traditional excavation).
- Integrity assessment and enhancement of the outer shells of the double shell tanks. We are seeing indications that moisture in the vadose zone may threaten the ability of the tanks to resist natural corrosion processes for the duration of the tank waste treatment mission, which is now estimated to stretch into the 2060s or beyond.
- Making a more durable cap. Most waste site caps have a life expectancy measured in decades; Hanford's wastes will clearly pose a risk far longer than that. Though Oregon is not supportive of wide-spread use of caps at Hanford, we do recognize the need for caps in some locations.
- The capability for characterizing and packaging remote-handled transuranic waste. Dealing with Hanford's remote-handled transuranic waste has been repeatedly been put off due to the lack of a facility or capability to safely characterize and package this waste.

Since cleanup began at Hanford and elsewhere around the DOE complex, DOE has not consistently been willing to invest meaningful funds towards technology development. We hope your assessment will spur new interest and funding toward finding new technologies to help the cleanup at Hanford and elsewhere in the DOE complex.

If you have questions about our comments, please contact me at ken.niles@oregon.gov, or at 503-378-4906.

Sincerely,

Ken Niles
Assistant Director for Nuclear Safety

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